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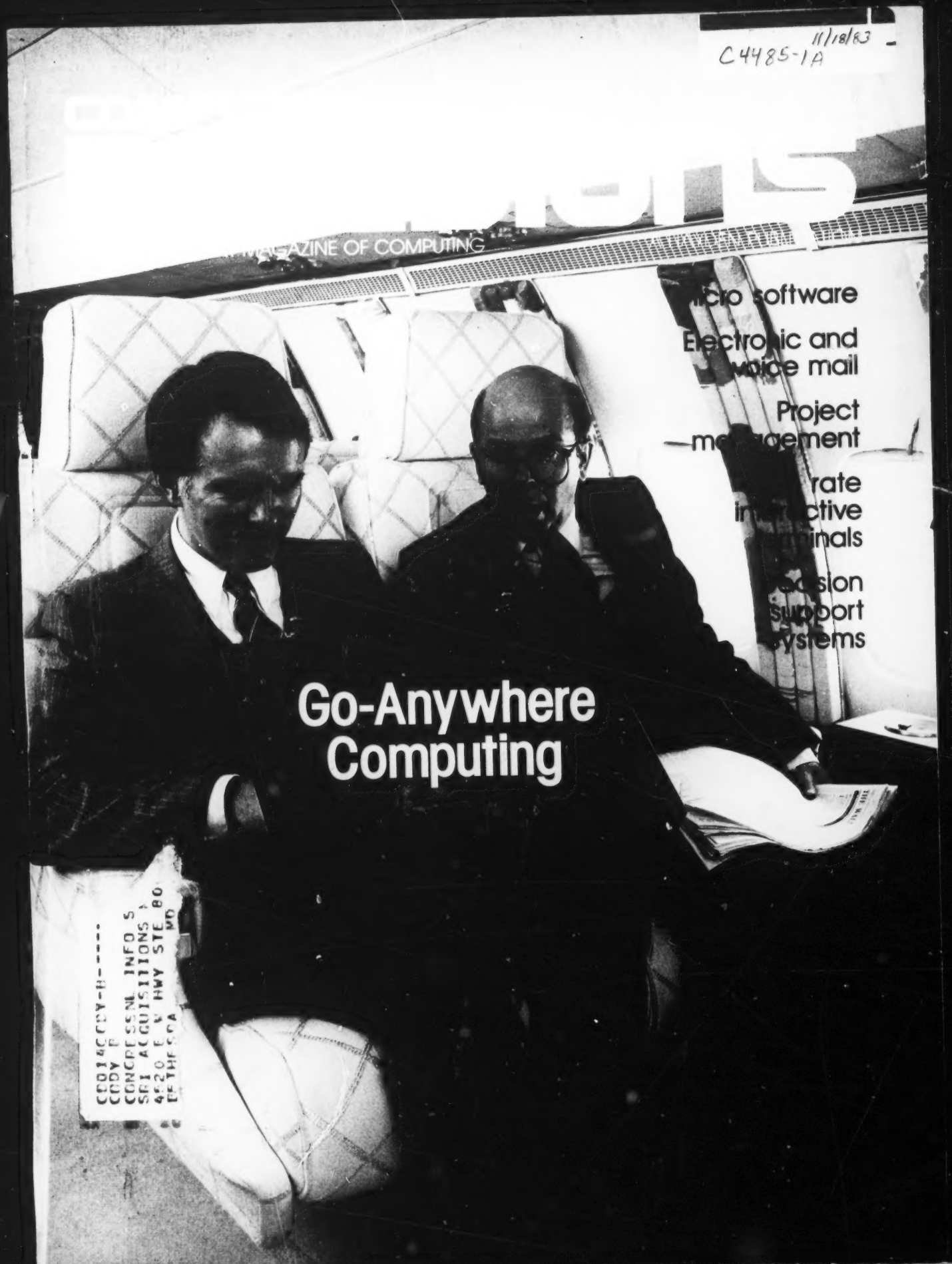


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COMPUTER DECISIONS®
THE MANAGEMENT MAGAZINE OF COMPUTING
NOVEMBER 1983
Volume 15 Number 12
Copies Printed: 169,094

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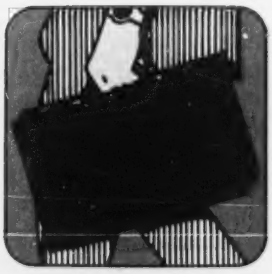

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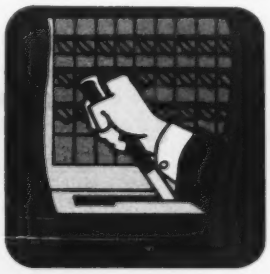

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COVER PHOTO: Rick Barrick

# Users Rate Interactive Terminals

*A new survey suggests that managers are sacrificing ergonomics and special features on the terminals they buy to get good vendor service.*

*by John J. Hunter, Data Decisions Inc.*

Terminals are a dilemma for computer managers: Buying models with productivity-raising ergonomic features often means sacrificing optimum service from vendors. Service and reliability, in the minds of managers, are of paramount importance. Thus, a survey of 50 widely used interactive terminals earlier this year suggests that forgoing "hot" features to get good service has become a way of life for managers.

Managers were asked to rate their terminals for overall performance; reliability and vendor support; ergonomics; and display, editing, and formatting features. The top finishers in the ergonomics and display-features categories generally didn't score as well in the vendor-service poll. Take the Decision Data 3751. It was rated best by respondents for display and ergonomic features. However, the Decision Data 3751 ranked 30th in terms of reliability and vendor support.

On the other hand, Hewlett-Packard's Models 2624 and 2622 ranked first and second, respectively, in the reliability/vendor-support poll. However, the two terminals ranked 17th and 11th in the ergonomics survey. The models fared a little better in the ranking on display, editing, and formatting features, finishing third and sixth, respectively.

How important are vendor support and reliability to managers? When asked to name the criteria they used to choose a particular terminal, half of the respondents said a vendor's reliability and reputation were "very important" factors. When asked for their single most important criterion, vendor reliability finished third, behind compatibility with existing equipment (a predictable answer) and price. Thirty-three percent said compatibility was their most important selection criterion. Price was most important to 12 percent of the respondents.

Given the importance managers assign to vendor service, the vendor-support poll might be considered a good indication of the respondents' preferences. The top five

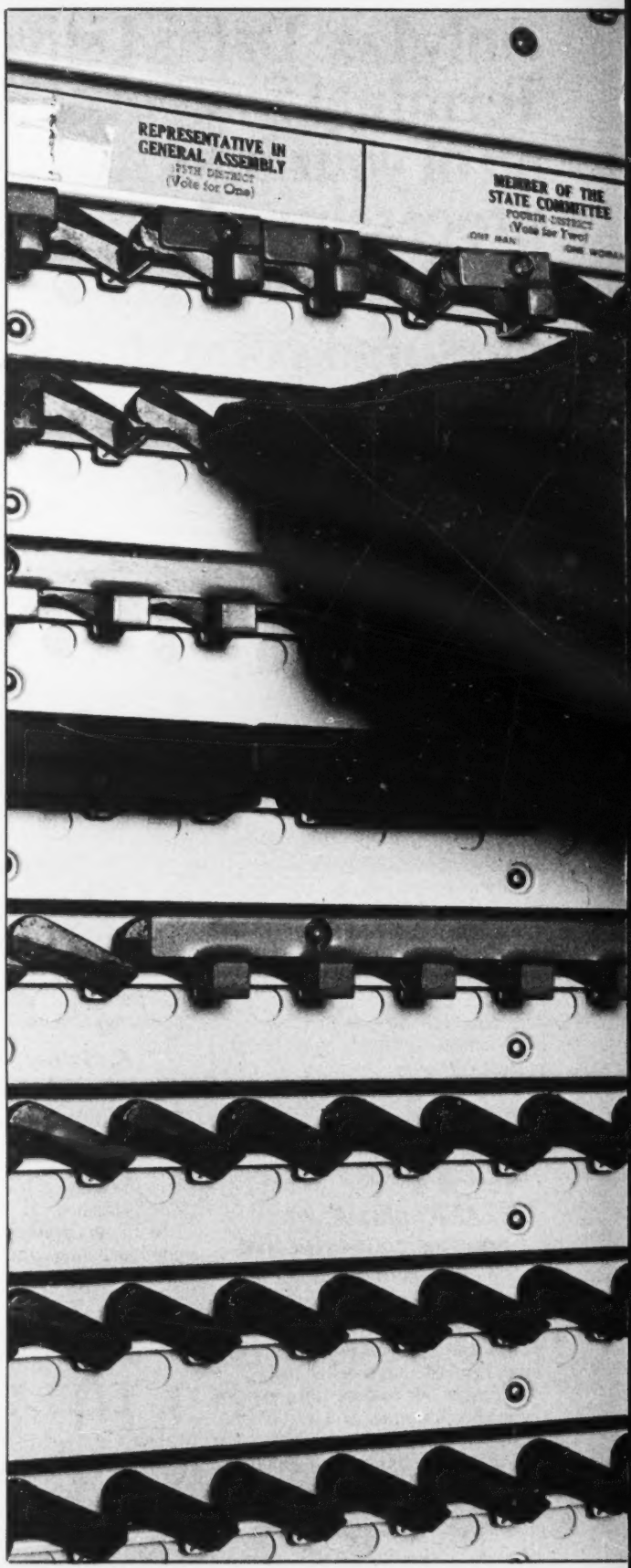


Photo by H. Armstrong Roberts

finishers in the vendor-support poll were the HP Models 2624, 2622, and 2640; the IBM 3278, and the HP 2621. The overall-performance rating also can be considered a good indication of managers' opinions. In it, the HP 2624, the HP 2626, the Televideo 925, the DEC VT100, and Televideo's 950 achieved the top five average scores. (See the accompanying charts for the top finishers in the other categories.)

These findings are based on the responses of 2,275 data-processing and other computer-involved managers. They were asked to rate their machines in the four categories, describe which activities their terminals are used for, and project how they expect to use terminals in the future. Generally, managers rate the terminals they've deployed as being "very good." Nineteen percent said they'd reorder terminals from their current vendor. Sixty-four percent believe their terminals have no limitations.

The survey has a definite management perspective, as indicated by the high marks most of the terminals received and the emphasis on vendor support. After all, most of the managers surveyed don't use the terminals. Data-entry professionals would probably place a heavier emphasis on ergonomics and special features if they had a voice in terminal purchasing.

Because the rankings are uniformly high for all categories—no terminal received a mark lower than 4.5 on a scale of 10—the survey has the appearance of a popularity contest among machines that are all popular anyway. None of the 50 terminals received the lowest rating ("inadequate"), and only three were rated as being less than "very good" in the important vendor-support survey. Those three were the Lear Siegler ADM-1 (which is no longer manufactured), the Burroughs TD/700, and the Raytheon PTS 100. Nevertheless, the survey results point to several interesting trends and some unexpected conclusions about managers' perception of their terminals.

**Taking ergonomics for granted**

The low priority managers gave good ergonomics was the survey's most unexpected result. Poor ergonomics, or designs that fail to accommodate the physical needs of users, have been singled out as the major cause of eyestrain, fatigue, and other work-related physical maladies among data-entry workers. Some experts blame low productivity on these biotechnological problems. Some vendors have incorporated features like tilting screens and tinted glass into their new models, promising to keep operators working in ergonomic harmony with their machines.

Among data-entry professionals, ergonomics has become a mantra. For managers, ergonomics could be meaningful because of its impact on productivity, but it was mentioned by so few managers on the purchasing-criteria question that it didn't even make the final list of nine features. Fewer than 1 percent of the managers listed good ergonomic qualities as a purchasing criterion.

Does this mean managers don't care about their operators or are indifferent to the importance of ergonomics? We don't think so. Rather, it appears that most managers *expect* the terminals they buy to have good ergonomic qualities. This conclusion is supported by another part of the survey: A majority of the respondents rated the terminals used at their sites as being "very good" (between

# Interactive Terminals

*(Continued from page 203)*

6 and 8 on a scale of 10) in eight ergonomic classifications. Considering that many of the terminals were designed during the mid-1970s, before the impact of good ergonomics on productivity was widely recognized, we were surprised they scored so well. The average scores follow.

| | |
|---|---|
| Keyboard layout | 6.8 |
| Feel of keys | 6.8 |
| Low keyboard/printer noise level | 6.7 |
| Numeric/control key layout | 6.7 |
| Screen position | 6.4 |
| Lack of keyboard-user fatigue | 6.2 |
| Lack of screen-user fatigue | 6.0 |
| Ease of adjustment | 6.0 |

Management sensitivity to the issue is also evident in the low scores some respondents gave their terminals in this poll, as indicated by high-low comparisons. Ratings for keyboard layout, for instance, range from 7.8 to 5.2. The bottom end of the range corresponds to a rating of "acceptable," a low score in the context of this survey. The range for feel of keyboard is 8.0 to 4.5; for noise level, it is 7.8 to 5.3; and for numeric/control key layout, it is 8.2 to 5.0. The range for keyboard-user fatigue is 7.1 to 4.4; for screen-user fatigue, it is 7.3 to 4.8; and for ease of adjustment, it is 8.0 to 4.6.

Like ergonomic designs, data-editing and formatting capabilities have been linked to higher productivity. Nevertheless, these features also landed near the bottom of the purchasing-priorities list. On another question, only 2.8 percent of the man-

## Overall performance

| | | |
|---|---|---|
| Hewlett-Packard 2626 ..... 8.0 | Hewlett-Packard 2640 ..... 7.3 | ADDS Regent 100 ..... 6.5 |
| Hewlett-Packard 2624 ..... 8.0 | Honeywell VIP 7800 ..... 7.3 | Lear Siegler ADM-2 ..... 6.5 |
| Televideo 925 ..... 8.0 | Televideo 910 ..... 7.3 | Lear Siegler ADM-3 ..... 6.3 |
| DEC VT100 ..... 7.9 | Televideo 912 ..... 7.3 | ADDS Regent 25 ..... 6.2 |
| Televideo 950 ..... 7.9 | Memorex 1377 ..... 7.2 | Hazeltine Module One ..... 6.2 |
| Hewlett-Packard 2622 ..... 7.7 | Teletype 40 ..... 7.2 | (Now made by Esprit) |
| IBM 3279 ..... 7.7 | Telex 278 ..... 7.2 | Microdata Prism ..... 6.2 |
| Decision Data 3751 ..... 7.6 | Data General D200 ..... 7.1 | Sperry Uniscope 100 ..... 6.2 |
| IBM 3276 ..... 7.6 | NCR 7900 ..... 7.1 | Burroughs TD/800 ..... 6.1 |
| Sperry UTS 20 ..... 7.6 | Honeywell VIP 7200 ..... 7.0 | Honeywell VIP 7700 ..... 6.1 |
| Wang 2236 ..... 7.6 | ADDS Viewpoint ..... 6.9 | Raytheon PTS 100 ..... 6.1 |
| Hewlett-Packard 2645 ..... 7.5 | Hewlett-Packard 2621 ..... 6.9 | Soroc IQ120 ..... 6.1 |
| Datapoint 8200 ..... 7.4 | IBM 3101 ..... 6.9 | IBM 3277 ..... 5.9 |
| IBM 3270 ..... 7.4 | IBM 3275 ..... 6.9 | NCR 796 ..... 5.9 |
| IBM 3278 ..... 7.4 | ADDS Regent 40 ..... 6.8 | Sperry Uniscope 200 ..... 5.9 |
| Telex 277 ..... 7.4 | Lear Siegler ADM-31 ..... 6.8 | Lear Siegler ADM-1 ..... 5.4 |
| Texas Instruments 911 ..... 7.4 | Televideo 920 ..... 6.8 | Burroughs TD/700 ..... 5.1 |

*9-10: Superior; 6-8: Very good; 3-5: Acceptable; 1-2: Inadequate. Average for terminals studied: 7.0.*

## Reliability and vendor support

| | | |
|---|---|---|
| Hewlett-Packard 2624 ..... 8.7 | Televideo 910 ..... 7.5 | Memorex 1377 ..... 6.8 |
| Hewlett-Packard 2622 ..... 8.3 | Televideo 925 ..... 7.5 | ADDS Regent 40 ..... 6.7 |
| Hewlett-Packard 2640 ..... 8.3 | Honeywell VIP 7800 ..... 7.4 | Lear Siegler ADM-3 ..... 6.7 |
| IBM 3278 ..... 8.3 | IBM 3275 ..... 7.4 | Sperry Uniscope 100 ..... 6.7 |
| Hewlett-Packard 2621 ..... 8.2 | IBM 3277 ..... 7.4 | Sperry Uniscope 200 ..... 6.6 |
| Hewlett-Packard 2626 ..... 8.2 | Telex 278 ..... 7.4 | Lear Siegler ADM-31 ..... 6.5 |
| IBM 3276 ..... 8.2 | Telex 277 ..... 7.3 | Televideo 920 ..... 6.5 |
| IBM 3279 ..... 8.2 | Texas Instruments 911 ..... 7.3 | ADDS Regent 25 ..... 6.3 |
| DEC VT100 ..... 8.1 | Honeywell VIP 7700 ..... 7.2 | ADDS Regent 100 ..... 6.3 |
| Hewlett-Packard 2645 ..... 8.1 | IBM 3101 ..... 7.2 | Burroughs TD/800 ..... 6.2 |
| IBM 3270 ..... 8.1 | Televideo 912 ..... 7.2 | Hazeltine Module One ..... 6.2 |
| Datapoint 8200 ..... 8.0 | Televideo 950 ..... 7.2 | (Now made by Esprit) |
| Data General D200 ..... 7.9 | Decision Data 3751 ..... 7.1 | Soroc IQ120 ..... 6.2 |
| Honeywell VIP 7200 ..... 7.8 | Microdata Prism ..... 7.1 | Lear Siegler ADM-2 ..... 6.0 |
| Wang 2236 ..... 7.8 | Teletype 40 ..... 7.0 | Raytheon PTS 100 ..... 5.8 |
| NCR 7900 ..... 7.7 | ADDS Viewpoint ..... 6.9 | Burroughs TD/700 ..... 5.5 |
| Sperry UTS 20 ..... 7.7 | NCR 796 ..... 6.9 | Lear Siegler ADM-1 ..... 5.4 |

*9-10: Superior; 6-8: Very good; 3-5: Acceptable; 1-2: Inadequate. Average for terminals studied: 7.3.*

# Interactive Terminals

*(Continued from page 204)*

agers listed inadequate editing and formatting features as a limitation of their organizations' terminals.

Data editing is the ability to change displays either through the terminal or remotely through the host processor. Adding and deleting characters are typical editing functions. Formatting capabilities usually include designating certain fields in a display as alphabetic or numeric only, protecting certain fields from alteration, and requiring that data be presented in a particular format.

Another unexpected result was the popularity of the nine old or discontinued terminals in the survey. From a strictly operational standpoint, the old terminals scored fairly well. For example, on the overall-performance scale, the Datapoint 8200, predecessor of the Model 8220, finished 12th, and Honeywell's VIP 7800 (replaced by the 7801) finished 16th. The Datapoint machine was rated *second* for ergonomics.

Datapoint's scores were unusually high among the older terminals. Most of the older models fell in the middle of the pack in the ratings for overall performance, display and editing features, and ergonomics. They scored lower in the reliability/vendor-support poll. Nonetheless, order of finish isn't everything in these polls: The majority of the older machines received high marks. Apparently, the enhancements offered by new models are not as important to managers as the core functions provided by earlier designs. The other machines that have been replaced by newer models are the ADDS Regent series, superseded by the Viewpoint; the Honeywell VIP 7700, which was replaced

## Ergonomics

| | | | | | |
|---|---|---|---|---|---|
| Decision Data 3751 | 7.6 | IBM 3279 | 6.7 | Teletype 40 | 6.2 |
| Datapoint 8200 | 7.1 | Televideo 912 | 6.7 | Televideo 920 | 6.2 |
| Sperry UTS 20 | 7.1 | Hewlett-Packard 2645 | 6.6 | Lear Siegler ADM-31 | 6.1 |
| Televideo 925 | 7.1 | Honeywell VIP 7200 | 6.6 | Hewlett-Packard 2621 | 6.0 |
| Memorex 1377 | 7.0 | Honeywell VIP 7800 | 6.6 | IBM 3275 | 6.0 |
| DEC VT100 | 6.9 | NCR 7900 | 6.6 | Raytheon PTS 100 | 6.0 |
| Hewlett-Packard 2626 | 6.9 | ADDS Regent 40 | 6.5 | ADDS Regent 100 | 5.9 |
| Televideo 950 | 6.9 | IBM 3276 | 6.5 | Lear Siegler ADM-2 | 5.9 |
| Texas Instruments 911 | 6.9 | ADDS Viewpoint | 6.4 | Lear Siegler ADM-3 | 5.8 |
| Data General D200 | 6.8 | Telex 278 | 6.4 | Sperry Uniscope 200 | 5.8 |
| Hewlett-Packard 2622 | 6.8 | Hewlett-Packard 2640 | 6.3 | Burroughs TD/700 | 5.7 |
| IBM 3101 | 6.8 | IBM 3278 | 6.3 | Honeywell VIP 7700 | 5.7 |
| IBM 3270 | 6.8 | Microdata Prism | 6.3 | Soroc IQ120 | 5.6 |
| Televideo 910 | 6.8 | ADDS Regent 25 | 6.2 | NCR 796 | 5.5 |
| Telex 277 | 6.8 | Hazeltine Module One | 6.2 | Burroughs TD/800 | 5.4 |
| Wang 2236 | 6.8 | (Now made by Esprit) | | IBM 3277 | 5.4 |
| Hewlett-Packard 2624 | 6.7 | Sperry Uniscope 100 | 6.2 | Lear Siegler ADM-1 | 4.9 |

*9-10: Superior; 6-8: Very good; 3-5: Acceptable; 1-2: Inadequate. Average for terminals studied: 6.4.*

## Display and editing/formatting features

| | | | | | |
|---|---|---|---|---|---|
| Decision Data 3751 | 7.6 | Honeywell VIP 7800 | 6.7 | Hewlett-Packard 2621 | 5.9 |
| Hewlett-Packard 2626 | 7.4 | IBM 3276 | 6.6 | Lear Siegler ADM-31 | 5.8 |
| Hewlett-Packard 2624 | 7.3 | Memorex 1377 | 6.6 | Sperry Uniscope 200 | 5.8 |
| Televideo 950 | 7.2 | Telex 278 | 6.6 | ADDS Regent 100 | 5.7 |
| Texas Instruments 911 | 7.2 | Datapoint 8200 | 6.5 | Burroughs TD/800 | 5.7 |
| Hewlett-Packard 2622 | 7.1 | DEC VT100 | 6.5 | Hazeltine Module One | 5.6 |
| Wang 2236 | 7.1 | Honeywell VIP 7200 | 6.4 | (Now made by Esprit) | |
| Sperry UTS 20 | 7.0 | IBM 3278 | 6.4 | Microdata Prism | 5.6 |
| Teletype 40 | 7.0 | ADDS Regent 40 | 6.3 | Sperry Uniscope 100 | 5.6 |
| Televideo 925 | 7.0 | IBM 3101 | 6.2 | ADDS Regent 25 | 5.5 |
| IBM 3270 | 6.9 | Lear Siegler ADM-2 | 6.2 | IBM 3277 | 5.3 |
| Hewlett-Packard 2645 | 6.8 | NCR 7900 | 6.2 | Honeywell VIP 7700 | 5.2 |
| IBM 3279 | 6.8 | Televideo 912 | 6.2 | Soroc IQ120 | 5.2 |
| Televideo 910 | 6.8 | Raytheon PTS 100 | 6.1 | Lear Siegler ADM-3 | 5.1 |
| Telex 277 | 6.8 | Televideo 920 | 6.1 | NCR 796 | 5.0 |
| Data General D200 | 6.7 | ADDS Viewpoint | 6.0 | Lear Siegler ADM-1 | 4.8 |
| Hewlett-Packard 2640 | 6.7 | IBM 3275 | 6.0 | Burroughs TD/700 | 4.5 |

*9-10: Superior; 6-8: Very good; 3-5: Acceptable; 1-2: Inadequate. Average for terminals studied: 6.4.*

# Interactive Terminals

*(Continued from page 206)*

by the 7710 and the 7740; Soroc's IQ120, replaced by the Challenger 50; and Lear Siegler Models ADM-1 and ADM-2, replaced by the ADM-31 and the ADM-42, respectively.

### The Ferrari and the Chevy

System designers and vendors generally believe faster response times raise productivity, helping user companies achieve greater profits. Many maintain that the cluster controllers and data-transmission lines in use are entirely too slow to support "acceptable" response times. The managers in the survey disagree. Respondents reported no significant problems with response time, either in cluster, or networked, arrangements or in line communications between stand-alone terminals.

A 15-terminal cluster with a normal load of transactions and a 9,600-bps transmission line responds to user queries within 2 to 4 seconds. IBM, which is emphasizing subsecond response times in its new offerings, believes this range is too slow. But to the managers who responded to the survey, the issue of transmission speed is analogous to the choice between buying a Ferrari and a Chevrolet. Many of the managers are happy with their practical Chevys, thank you.

The average cluster controller in the responding user organizations controls 11 terminals in a network. For example, IBM 3270 clusters averaged 11 Model 3277 or 3279 terminals; those using 3278 terminals averaged 27 per cluster.

At the surveyed user sites, two of three terminals are used as single-station stand-alones. That's not surprising, but some of the other results have interesting implications.

Some 77 percent of the respondents use terminals connected locally via coaxial cable or twisted-pair wiring. Thirty-four percent use private or leased telephone lines. Only 15 percent of the respondents said they had remote terminals connected via dialup telephone lines. These statistics suggest that managers are paying a high price for data communications.

The coaxial cable and twisted-pair wiring used to connect terminals locally are expensive to buy and install between terminal and processor. Multiplexers, which combine transmissions from many slow-speed lines on one high-speed line, could reduce the number of lines required for communications—and cut costs. Multiplexers also enable communications between processors and terminals to take place over greater distances.

Terminals at surveyed sites are most commonly operated at a trans-

---

*The primary objective of this research was to measure users' perceptions of 50 widely used interactive terminals. For each terminal identified as being used at more than 100 installations, a sample of 100 sites was chosen. For those used at 100 or fewer sites, the sample included all known sites. The samples were chosen from a list of installations maintained by Computer Intelligence Corp., La Jolla, CA.*

*The survey began on June 6, 1983, when 4,999 questionnaires were mailed to users of the 50 terminals at 4,337 sites. Questionnaires were addressed to a specific manager at each site, most commonly the data-processing manager. The mailing included a $1 incentive and a post-paid envelope. Only one mailing was made. The survey questionnaire asked the following questions about terminal usage.*

- *How many units are used as stand-alones; how many are used in cluster systems?*
- *For which functions is the terminal used? Is it connected locally and/or remotely for each function?*
- *For which functions is the terminal expected to be used in the future? Will it be used with local and/or remote connections for each function?*
- *Which factors were involved in your decision to acquire your organization's terminals? What were their relative importance?*
- *Have you encountered any limitations?*
- *Will you acquire the same terminal if additional units are needed?*
- *In which communications environment does the terminal operate, and at which transmission speeds?*

*Managers were also asked to rate their organization's terminals on a scale of 1 to 10 for ergonomic qualities; display features, data editing/formatting features; system reliability, quality and timeliness of vendor and/or third-party support; and overall performance. The 10-point scale also included verbal values. One-2 was "inadequate," 3-5 was "acceptable," 6-8 was "very good," and 9-10 was "superior."*

*When the survey was closed on July 6, 2,816 questionnaires from 2,450 sites had been received, a response rate of 56 percent. Twelve questionnaires were returned as undeliverable. Five hundred forty-one respondents said they were not using one of the terminals under study, and they were removed from the tabulations.*

*The findings presented in this article reflect the particular dimensions probed in the survey. They are not intended to be all-inclusive, and the ratings are not necessarily comparable to results that would have been obtained from a controlled engineering test or experiment. A terminal's average score on a specific criterion is based on all managers who offered a rating. The managers who said the criterion did not apply to their terminals, or who simply did not rate their terminals in a particular category, are not reflected in the average score.*

*As in all sample surveys, the results are estimates within a range of what would have been obtained if all members of the universe were surveyed. The margins of sampling variation, or tolerances, applicable to the ratings of individual aspects of terminal performance are as follows. (They include a 68 percent confidence level.)*

| | 5.0 or under | 6.0 | 7.0 | 8.0 or under |
|---|---|---|---|---|
| Sample size | | | | |
| 55 and over | .40 | .30 | .25 | .20 |
| 50-54 | .40 | .30 | .25 | .25 |
| 40-49 | .40 | .30 | .30 | .25 |
| under 40 | .40 | .35 | .35 | .30 |

*This means that the chances are approximately two in three that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained if all eligible sites had been surveyed. For example, suppose a sample of 50 sites gives a terminal a rating of 7.0 on a specific attribute. The table indicates a tolerance of .25. Thus, the chances are two in three that the range 6.75-7.25 will include the rating that would have been obtained if all eligible sites had been surveyed.*

*The material in this article is based on a survey conducted under the direction of Data Decisions Inc., a research and consulting firm that publishes information on computer systems, communications systems, and software. The full report (Report P116-AL), which provides detailed statistics on each terminal, is available for $29 from Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034, (609) 429-7100.*

# Interactive Terminals

*(Continued from page 208)*

mission speed of 9,600 bits per second (at 47 percent of the user sites). Twenty-one percent of the respondents operate at 4,800 bps, 20 percent operate at 2,400, and 20 percent operate at 1,200 bps. In these communications setups, response times are generally quick. Thus, most of the respondents don't need speed-up features like block- and page-mode. Also, most managers aren't impressed with the ability of block- and page-mode features to accelerate the line-at-a-time transmission speeds of terminals. Only 1 percent of the respondents listed the absence of block-mode as one of their terminals' liabilities.

The ability of terminals to be modified to handle graphics and personal-computing capabilities seems destined to become an important factor in future purchasing decisions. At the sites surveyed, most of the terminals are being used for the bread-and-butter chores of inquiry/update (90 percent), data entry (84 percent), and program development (70 percent). However, when users were asked to forecast their needs over the next five years, they predicted that their need for graphics and personal-computing capabilities would rise by about 10 percent each. Six percent of the sites currently run graphics on their terminals; 10 percent have personal-computing enhancements. By 1988, inquiry/update and data entry will fall about 10 percent each and program development will drop about 5 percent, the respondents said.

> "Half of the respondents listed vendor reputation and reliability as very important factors in selection of terminals."

There doesn't seem to be any correlation between the decline of one activity and the increase of another, but the importance of personal computing and graphics points to a small but steady shift in the orientation of user companies. Business graphics and personal computing are the domain of management—a group that has traditionally resisted using terminals.

Will more managers use terminals in the future? Can this change be attributed to the widespread acceptance among managers of microcomputers? Maybe. For the moment, it means that terminals that can't be upgraded probably won't be acceptable to many managers. Of the terminals surveyed, only those offered by Digital Equipment Corp. (DEC) and IBM offer intelligent upgrades.

The terminals surveyed are not only good, they don't have a single limitation, according to almost two-thirds of the respondents. We aren't surprised by this result. After all, the terminals were most likely purchased by the respondents, who naturally believe they made good selections. Also, most of the organizations surveyed use terminals for the simple applications of inquiry/update and data entry. However, managers listed a few complaints.

Incompatibility with other computer systems headed the list of limitations with a measly 6 percent of the respondents. Obviously, a terminal that's incompatible with an existing system is a problem. But compatibility also often refers to how a terminal "fits into" an operation.

Other limitations included limited expandability, poor keyboard layout, lack of special-function keys, limited editing and formatting capabilities, and age. Each of these factors was mentioned by a relatively insignificant number of managers, however. All in all, the managers believe the advantages offered by their terminals outweigh their limitations. □

*John J. Hunter is a senior editor/analyst with Data Decisions Inc., Cherry Hill, NJ.*


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